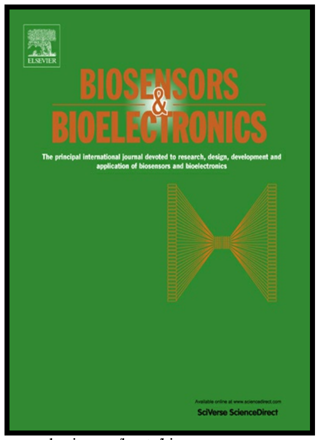

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Abstract

A critical need exists to develop rapid, *in situ*, and real-time tools to monitor the impact of pollution discharge toxicity on aquatic ecosystems. The present paper deals with the development of a novel, simple-to-use, low-cost, portable, and user-friendly algal biosensor. In this study, a complete and autonomous portable fluorimeter was developed to assess the A-chlorophyll fluorescence of microalgae, inserted by capillarity into low-cost and disposable xurography-based microfluidic chips. Three microalgae populations were used to develop the biosensor: *Chlorella vulgaris*, *Pseudokirchneriella subcapitata*, and *Chlamydomonas reinhardtii*. Biosensor feasibility and sensitivity parameters, such as algal concentration and light intensity, were optimized beforehand to calibrate the biosensor sensitivity with Diuron, a pesticide known to be very toxic for microalgae. Finally, the biosensor was employed in 10 aqueous urban polluted samples (7 urban wet-weather discharges and 3 wastewater) in order to prove its reliability, reproducibility, and performance in the detection of toxic discharges in the field.

Keywords: Microfluidic biosensor, Microalgal A-chlorophyll fluorescence, Xurography, Portable fluorimeter, Pesticide, Urban polluted water.